MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (TERM ID: 2220)

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology)

14 JULY 2023
9:00 a.m. –11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS:

1. This exam paper consists of 5 **pages** (including cover page) with 5 Questions only.

2. Attempt all the questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. Show all relevant steps to obtain maximum marks.

Question 1 [10 marks]

(a) Find the product of (i) AB and (ii) BA. Given that matrices of

$$A=\begin{bmatrix}2 & -3 & 1\\ 0 & -4 & 3\\ 5 & 1 & 7\end{bmatrix} \text{ and } B=\begin{bmatrix}4 & 6 & 1\\ 5 & 3 & -2\\ 1 & 0 & 5\end{bmatrix}$$

[3 marks]

(b) Solve the following system of linear equations by using inverse matrix.

$$\begin{aligned} x \quad &+ 7z = 20\\ 2x + y \ &- z = -3\\ 7x + 3y \ &+ z = 2 \end{aligned}$$

[7 marks]

Question 2 [10 marks]

(a) Find an equation for the line that contains the point (-4, 1) and is perpendicular to the line $5x - 3y = 10$. [4 marks]

(b) Find the equation of the directrix, the coordinates of vertex and focus of the parabola given by the equation,

$$3x + 2y^2 + 8y = 4$$

[6 marks]

Question 3 [10 marks]

(a) Let $z = 3(\cos 30^\circ + i \sin 30^\circ)$ and $w = 8(\cos 60^\circ + i \sin 60^\circ)$,

(i) Write z and w in the standard form $a + bi$. [1 marks]

(ii) perform $z \cdot w$ and $\frac{z}{w}$. Write the results in the standard form $a + bi$.

[5 marks]

(b) Let $z = -2\sqrt{3} - 2i$. Find the polar form of z. [4 marks]

Continued...

Question 4 [10 marks]

(a) Given that tan α = -4/3 for α in Quadrant II, tan β = -5/12 for β in Quadrant IV. Find $\sin(\alpha-\beta)$. [5 marks]

(b) The terminal side of an angle in standard position intersects the unit circle at $P\left(\frac{5}{7}, -\frac{2\sqrt{6}}{7}\right)$. If the measure of the angle is θ, find the six trigonometric function values. [5 marks]

Question 5 [10 marks]

(a) Solve the triangle ABC, given $c = 25$, $A = 35°$, and $B = 68°$. [4 marks]

(b) Verify the identity,

(i) $\dfrac{\sec x}{\cot x + \tan x} = \sin x$ [3 marks]

(ii) $\dfrac{\sin x}{1+\cos x} = \dfrac{1-\cos x}{\sin x}$ [3 marks]

Continued...

APPENDIX

Quotient Identities

$\tan x = \dfrac{\sin x}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$

Reciprocal Identities

$\csc x = \dfrac{1}{\sin x}$ $\sec x = \dfrac{1}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$

Pythagorean Identities

$\cos^2 x + \sin^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $\cot^2 x + 1 = \csc^2 x$

Cofunction Identities

$\sin\left(\dfrac{\pi}{2} - \theta\right) = \cos\theta$ $\cos\left(\dfrac{\pi}{2} - \theta\right) = \sin\theta$

$\tan\left(\dfrac{\pi}{2} - \theta\right) = \cot\theta$ $\cot\left(\dfrac{\pi}{2} - \theta\right) = \tan\theta$

$\sec\left(\dfrac{\pi}{2} - \theta\right) = \csc\theta$ $\csc\left(\dfrac{\pi}{2} - \theta\right) = \sec\theta$

Even/Odd Identities

$\sin(-\theta) = -\sin(\theta)$ $\cos(-\theta) = \cos(\theta)$ $\tan(-\theta) = -\tan(\theta)$

$\csc(-\theta) = -\csc(\theta)$ $\sec(-\theta) = \sec(\theta)$ $\cot(-\theta) = -\cot(\theta)$

Sum/Difference Formula

$\cos(A + B) = \cos A \cos B - \sin A \sin B$

$\cos(A - B) = \cos A \cos B + \sin A \sin B$

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

$\sin(A - B) = \sin A \cos B - \cos A \sin B$

$\tan(\alpha + \beta) = \dfrac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$ $\tan(\alpha - \beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$

Product-to-Sum Formulas:

$\sin x\cos y = \dfrac{1}{2}(\sin(x - y) + \sin(x + y))$

$\sin x\sin y = \dfrac{1}{2}((\cos(x - y) - \cos(x + y))$

$\cos x\cos y = \dfrac{1}{2}(\cos(x - y) + \cos(x + y))$

$\cos x\sin y = \dfrac{1}{2}[\sin(x + y) - \sin(x - y)]$

Continued...

Sum to Product Formulas:

$$\sin x+\sin y=2\left(\sin\left(\tfrac{x+y}{2}\right)\cos\left(\tfrac{x-y}{2}\right)\right)$$
$$\sin x-\sin y=2\left(\cos\left(\tfrac{x+y}{2}\right)\sin\left(\tfrac{x-y}{2}\right)\right)$$
$$\cos x+\cos y=2\left(\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)\right)$$
$$\cos x-\cos y=-2\left(\sin\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)\right)$$

Half -angle Formulas:

$$\sin\frac{\alpha}{2}=\pm\sqrt{\frac{1-\cos\alpha}{2}}\quad;\quad\cos\frac{\alpha}{2}=\pm\sqrt{\frac{1+\cos\alpha}{2}}\quad;\quad\tan\frac{\alpha}{2}=\pm\sqrt{\frac{1-\cos\alpha}{1+\cos\alpha}}$$

Some widely used ratios:

$\sin 60^\circ=\frac{\sqrt{3}}{2}$	$\cos 60^\circ=\frac{1}{2}$	$\tan 60^\circ=\sqrt{3}$
$\sin 30^\circ=\frac{1}{2}$	$\cos 30^\circ=\frac{\sqrt{3}}{2}$	$\tan 30^\circ=\frac{1}{\sqrt{3}}$
$\sin 45^\circ=\frac{1}{\sqrt{2}}=\frac{\sqrt{2}}{2}$	$\cos 45^\circ=\frac{1}{\sqrt{2}}$	$\tan 45^\circ=1$

Law of Sines

$$\frac{\sin A}{a}=\frac{\sin B}{b}=\frac{\sin C}{c}$$

Law of Cosines

$$c^2=a^2+b^2-2ab\cos C$$
$$b^2=a^2+c^2-2ac\cos B$$
$$a^2=b^2+c^2-2bc\cos A$$

End of paper.